

# STUDIES ON THE GENUS *CYMBOPOGON* SPRENG. VIII:<sup>1</sup> A contribution to the classification of Indian species of *Cymbopogon*

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An artificial key has been prepared for 23 Indian species of *Cymbopogon* Spreng., which have been placed under 3 series. The original rank of *Cymbopogon confertiflorus* (Steud.) Stapf has been restored.

During the course of a cytosystematic study of the Indian *Cymbopogon*, I had the opportunity of studying natural populations of various species of this genus in different parts of India besides the herbarium specimens at the principal Herbaria of India. (BLAT, CAL, MH, LWG, BSD, DD and Fyson collections maintained in the Herbarium of the Presidency College, Madras). Many of these were also grown in the Sir Ram Nath Chopra garden of medicinal plants at Regional Research Laboratory, Jammu and detailed observations made on their growth habits and floral characters. In all, 23 species were studied which included three new species and seven new varieties described by me (Gupta 1970a,b,c, d). Bor (1963) reported that *C. schoenanthus* (Linn.) Spreng. does not occur in India and assigned all the Indian specimens included under this species to *C. olivieri* (Boiss.) Bor. Similarly *Cymbopogon tibeticus* Bor has been transferred to *Andropogon tristis* Nees ex Hack. (Bor 1973). All these facts have necessitated provision of an artificial key to the Indian *Cymbopogon* including the newly described taxa.

The classification of the Indian species of *Cymbopogon* has been attempted in the past

by Hackel (1889), Hooker (1896), Stapf (1906), Camus (1921) and Bor (1953). Bor reduced *C. confertiflorus* (Steud.) Stapf to varietal rank under *C. nardus* (Linn.) Rendle which is considered as the mother plant of the latter (Bor 1953, p. 895). However, no uniform criteria have been followed in placing different races or forms under a specific or varietal rank. For instance *C. confertiflorus* (Steud.) Stapf has been reduced to varietal rank because the oil obtained from this species is similar to *C. nardus* (Linn.) Rendle (Bor 1953, p. 895). On the other hand, the erection of two species *C. nardus* (Linn.) Rendle and *C. winterianus* Jowitt from *C. nardus* Rendle on slight morphological differences has been supported, although the oil obtained from both is similar (Bor 1953, p. 907). Secondly, a support for a specific rank to *C. caesius* (Nees) Stapf and *C. martinii* (Roxb.) Wats. var. *sofia* Gupta, on morphological grounds has been expressed, although the oil obtained from *C. martinii* var. *sofia* and *C. caesius* is similar (Bor 1953, p. 896). Thirdly, *C. jwarancusa* (Jones) Schult. and *C. olivieri* (Boiss.) Bor have been treated at the specific rank though they yield a similar oil (Gupta 1969c).

There are now two possibilities, either to treat *C. confertiflorus* as a variety of *C. nardus* or to consider it as a separate species irrespective of the nature of oil obtained from

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it. In my opinion, the restoration of an original rank of species to this plant is most desirable for the following reasons.

1. Bor transferred *C. confertiflorus* under *C. nardus* as a variety in the light of Mr. Jowitt's findings on these grasses (Bor 1953, p. 890).

2. Jowitt's opinion about the nomenclature of 'nardus complex' is recorded here in his own words which runs thus "It may be that it is possible to recognize two species of *mana*, an awned and awnless one, but neither of them includes Mahapangiri" (Jowitt 1908, p. 187).

3. In India—*C. nardus* is found under cultivation only and usually not allowed to flower.

4. The Indian specimens placed under *C. nardus* var. *confertiflorus* are quite different from the Sri Lanka ones, i.e. the upper lemma of sessile spikelet is always bilobed up to the middle and awned in the sinus. The difference has been found to be constant with Indian specimens. Haines (1921) even went a step further in not recognizing the awnless plant as a valid species since no definite locality is known for its occurrence in India, and has described another awned species under the name *C. nardus* Linn. which is probably a plant belonging to *C. confertiflorus*.

5. The concentration of *Cymbopogon confertiflorus* is more in south India than in Sri Lanka (Bor 1953, p. 905). It is also probable that Jowitt sheets of 'Nardus complex' might be representing a case of introgressive hybridization—as all the ten specimens examined by him did not show constancy in their awn and upper lemma characters and represented a mixture of these two species and their distribution is also overlapping in Sri Lanka. Both interspecific and intraspecific hybridization are also prevalent in this genus (Bor

1953, Gupta 1971).

6. Both the species under consideration have been grown side by side by me and they do give a different facies.

7. If the classification is considered on the basis of the constituents of the oil, then *C. caesius* demands a varietal rank under *C. martinii*; *C. nardus* and *C. winterianus* Jowitt should be merged together under a single species; a similar consideration also applies to *C. citratus* Stapf and *C. pendulus* (Nees ex Steud.) Wats. where the main constituent of the oil is the same, citral.

Considering all these facts and for the sake of simplicity and to avoid further change in nomenclature, it is desirable to treat all these species reported by Bor (1953, 1963, 1973) as distinct and valid and also raising *C. confertiflorus* to its original rank.

In providing a key to the species reported here, it has been found convenient to place them under the following three series of Stapf (1906):—

A. Basal leaves linear, more or less filiform and rarely exceeding 0.6 cm in their breadth at the middle of the leaf; panicles more often narrow, of short, dense fascicles of raceme pairs or of 1-2 raceme pairs—series *Schoenanthi*.

B. Basal leaves more or less lanceolate, always more than 1 cm in breadth at the middle of the leaf with well developed midrib on the ventral side; panicles more often large and compound—series *Citrati*.

C. Basal as well as other leaves cordate, subcordate or rounded at the base; old culms naked at the base or with the withered remains of the basal leaf sheaths; lower glume of sessile spikelets with a slit like groove in the lower half which appears as a rib on the inner surface—series *Rusae*.

## KEY TO THE SPECIES

- A. 1. Grasses aromatic
2. Joints and pedicels profusely hairy, hairs more or less concealing the sessile spikelets;
3. Pedicel of the lowest spikelet of sessile raceme swollen.
4. Lower glume of sessile spikelet lanceolate, acute, not oblique at apex and with broader groove on the back ..... *C. parkeri*
5. Keel nerves of lower glume of sessile spikelets scabrid ..... *C. parkeri* var. *parkeri*
5. Keel nerves of lower glume of sessile spikelet winged .... *C. parkeri* var. *jammuensis*
4. Lower glume of sessile spikelet elliptic-acute, slightly oblique at apex and without any groove on the back ..... *C. ramnagarensis*
3. Pedicel of the lowest spikelet of sessile raceme not swollen.
6. Basal leaves filiform,
7. Sessile spikelets always less than 5 cm long, lower glume elliptic-acute ..... *C. olivieri*
7. Sessile spikelets always over 5 mm long, lower glume oblong-acuminate ..... *C. ladakhensis*
6. Basal leaves linear, flat or V-shaped in transverse section ..... *C. jwarancusa*
8. Lowest pair of spikelets of sessile raceme more or less homomorphous and homogamous ..... *C. jwarancusa* var. *jwarancusa*
8. Lowest pair of spikelets of sessile raceme heteromorphous and heterogamous ..... *C. jwarancusa* var. *assamensis*
2. Joints and pedicels hairy but not concealing the sessile spikelets;
9. Sessile spikelets less than 4.75 mm long, lower glume with a deep groove in the lower half ..... *C. stracheyi*
9. Sessile spikelets over 5.5 mm long
10. Lower glume of sessile spikelet with a concave groove from base to apex, puberulent at the bottom, not oblique ..... *C. hookeri*
10. Lower glume of sessile spikelet with a shallow, continuous or interrupted groove from base to apex, usually oblique .. *C. distans*
11. 1 to 2 branches (rarely 3) arising from each node of the axis and ending in a pair of racemes, intercarinal nerves more than 2 on the back of the lower glume of sessile spikelet ..... *C. distans* var. *distans*
11. More than 2 branches arising from each node of the axis and ending into a pair of racemes, intercarinal nerves 2 or absent on the back of the lower glume of sessile spikelet ..... *C. distans* var. *mundensis*
1. Grasses almost non aromatic.
12. Spikelets less than 3.5 mm long, lower glume of sessile spikelets without prominent boss in the lower half ..... *C. microtheca*
12. Spikelets over 4 mm long, lower glume of sessile spikelet with a prominent boss in the lower half ..... *C. gidarba*
- B. 13. Basal leaf sheaths persistent when old and not bright reddish inside:
14. Pedicel of the lowest pedicelled spikelet in the sessile raceme swollen:
15. Basal leaf sheaths do not curl spirally when old, panicle narrow, interrupted and congested ..... *C. coloratus*
15. Basal leaf sheaths curls spirally when old, panicles effuse, spreading and drooping ..... *C. travancorensis*
14. Pedicel of the lowest pedicelled spikelet in the sessile raceme not swollen:
16. Sessile spikelets always less than 5 mm long ..... *C. flexuosus*
17. Panicles large and dense .... *C. flexuosus* var. *flexuosus*
17. Panicles large, lax, spreading or drooping:
18. Panicles long, slender, erect, bearing very few distant solitary erect branches with one or two epinastically deflexed raceme pairs ..... *C. flexuosus* var. *microstachys*
18. Panicles very large, much branched and the drooping branches with numerous raceme pairs:
19. Keel nerves of the lower glume of sessile spikelet narrowly winged from the apex.... ..... *C. flexuosus* var. *sikkimensis*
19. Keel nerves of lower glume of sessile spikelet broadly winged little below the apex ..... *C. flexuosus* var. *coimbatorensis*
16. Sessile spikelets always more than 5 mm long:
20. Lower glume of sessile spikelet concave, grooved from base to apex .... *C. pendulus*
20. Lower glume of sessile spikelet flat:
21. Sessile spikelets awnless ..... *C. citratus*
21. Sessile spikelets awned ..... *C. khasianus*
22. Lower glume of sessile spikelet glabrous ..... *C. khasianus* var. *khasianus*

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22. Lower glume of sessile spikelet hairy  
..... *C. khasianus* var. *nagensis*
13. Basal leaf sheath persistent when old and  
always brick red inside\*
23. Sessile spikelets awnless ..... *C. nardus*
23. Sessile spikelets awned .... *C. confertiflorus*
- C. 24. Pedicel of the lowest-pedicelled spikelet of  
sessile raceme not swollen:
25. Sessile spikelets awnless .... *C. osmostonii*
25. Sessile spikelets awned.
26. Inflorescence a simple panicle, one or two  
branches arising from each node of the axis  
and ending into a divaricate raceme pair at  
maturity ..... *C. polyneuros*
26. Inflorescence a large, much branched com-  
pound panicle ..... *C. motia*
24. Pedicel of the lowest pedicelled spikelet of  
sessile raceme grossly swollen:
27. Leaf blades linear, round at the base; in-  
florescence not bright red at maturity.....  
*C. caesius*
27. Leaf blades cordate or subcordate at base;  
Inflorescence bright red at maturity .....  
*C. martinii*
28. Lower glume of sessile spikelet elliptic-acute

- (excluding the wings) and broader at apex  
..... *C. martinii* var. *martinii*
28. Lower glume of sessile spikelet lanceolate  
acute (excluding the wings) and narrower at  
apex ..... *C. martinii* var. *sofia*

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### REFERENCES

- BOR, N. L. (1953): The genus *Cymbopogon* in India, Pt. I. *J. Bombay nat. Hist. Soc.* 51:890-911.
- (1963): A new name in *Cymbopogon* Spreng. *Notes. Roy. Bot. Gdn. Edinburgh*, 25:61-62.
- (1973): The grasses of Burma, Ceylon, India and Pakistan. Netherlands.
- CAMUS, A. (1921): Les Andropogonees odorates des region tropicales. *Rev. Bot. Appl.* 1:270-306.
- GUPTA, B. K. (1969): Studies in the genus *Cymbopogon* Spreng. II. Chemocytotaxonomic studies in Indian Cymbopogons. *Proc. Ind. Acad. Sci.* 70-B: 241-247.
- (1970a): Studies in the genus *Cymbopogon* Spreng. IV. A new species of *Cymbopogon* from Ladakh, *ibid.* 71 B: 9-12.
- (1970b): Studies in the genus *Cymbopogon* Spreng. V. A new species of *Cymbopogon* from Ramnagar. *ibid.*, 71 B: 86-89.
- (1970c): Studies in the genus *Cymbopogon* Spreng. VI. A new name in genus *Cymbopogon*. *ibid.*, 71 B: 90-93.
- (1970d): Studies in the genus *Cymbopogon* Spreng. VII. Some new varieties in Indian Cymbopogons. *ibid.*, 71 B: 94-100.
- (1971): A note on the occurrence of natural hybrids in Indian Cymbopogons. *Plant Science* 3: 120.
- HACKEL, E. (1889): Andropogoneae in D'Can-dolle *Monographic Phanerogamin.* 6:1-716.
- HAINES, H. H. (1921): The Botany of Bihar and Orissa. London. Part V. 1044-1048.
- HOOKE, J. D. (1896): Flora of British India. London. 7:164-210.
- STAPF, OTTO (1906): The oil grasses of India and Ceylon. *Kew Bull.* 1906: 297-363.
- JOWITT, J. F. (1908): Notes on Dr. Otto Stapf's nomenclature of *Cymbopogon nardus* Rendle and *C. confertiflorus* Stapf. *Ann. Roy. Bot. Gdn. Peradeniya* 4:185-193.